MICRO-SYSTEMS

PHOTONICS

James A. Lott
Professor
PhD, University of New Mexico, 1993
- Semiconductor Physics and Lasers
- Photonic Devices and Systems
- Vertical Cavity Surface Emitting Lasers (VCSELs)
- Micro-Electro-Mechanical Systems (MEMS)

e-mail: James.Lott@afit.edu
phone: 937-255-3636 x 4576

Micro-systems are essential components of all modern military systems including aerospace, computation, communication, command and control, and electronic warfare systems. Integrated microelectonic circuits have been at the heart of the United States' technological revolution for well over 30 years. Electronic aerospace systems containing millions to billions of transistors and all varieties of electronic and electro-optical sensors have long been paramount to the technological superiority of the U.S. military. The revolution continues as miniature optical and electro-mechanical structures are integrated side by side with the electronic devices, and the minimum topological feature sizes of the devices decrease from micrometers to nanometers. These advances continue to greatly increase military system functionality and ease of manufacture while simultaneously reducing both size and cost.

The micro-systems group focuses on the research and development of a plethora of materials, devices, and other integrated structures of current Air Force and DoD interest. The group works closely with faculty members in a variety of disciplines to develop innovative, synergistic solutions. Example interdisciplinary research areas include environmental sensing, flight control sensors, radiation tolerant optical communication systems, micro-optic gyroscopic sensing, ultra-violet and infrared emitters and detectors, and adaptive micro-optics for target identification and tracking.

NANOTECHNOLOGY

MEMS micro-mirror arrays for adaptive optics and optical interconnects.

SPACE ELECTRONICS

The micro-systems group works closely with the Air Force Research Laboratory (AFRL), the Air Force Office of Scientific Research, and several other units. Recent projects include studies of the fundamental properties of new semiconductor materials, microcavity lasers and arrays for high bandwidth optical communications, and radiation hardened VLSI electronics for space applications. In the explosive area of micro-electro-mechanical systems (MEMS), research projects include the sensing of biological hazards, gallium-arsenide MEMS structures, MEMS sensors for high temperature environments such as inside jet engines, and tunable lasers for spectroscopic analysis in space.

Research and teaching on the design, simulation, and testing of VLSI circuits and MEMS structures is performed in the well-equipped VLSI laboratory. Research and teaching on microelectronic materials and device physics, semiconductor characterization, MEMS, and device fabrication is performed in a new state-of-the-art 3,000 square foot clean room and characterization laboratory.

Interdepartmental

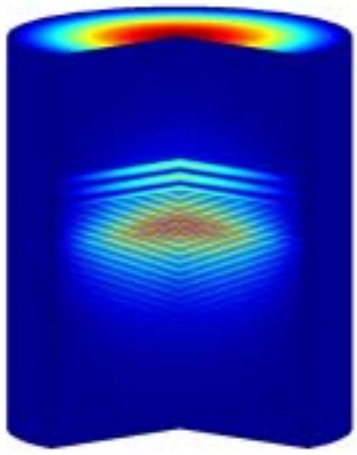
- Professors from other departments also support this area through their interdisciplinary efforts:

Michael A. Marciniak
Assistant Professor
PhD, Air Force Institute of Technology, 1995

- Optical properties of semiconductors
- Mid-infrared semiconductor lasers
- Optically activated, wide-band-gap semiconductors
- Quantum Well Detectors

e-mail: Michael.Marciniak@afit.edu
phone: 937-255-3636 x 4805

SEMICONDUCTOR MATERIALS



Finite Element modeling of the three-dimensional optical modes of tunable semiconductor microlasers.

MEMS tunable micromirrors for optical communications.